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PRELIMINARY STUDY FOR AN IMPROVED INFORMATION TRANSFER SYSTEM FOR METRO LIBRARIES. METRO MISCELLANEOUS PUBLICATION SERIES, NUMBER 2.

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THIS PRELIMINARY STUDY OF A COMMUNICATIONS SYSTEM AMONG THE APPROXIMATELY FIFTY AFFILIATES OF THE NEW YORK METROPOLITAN REFERENCE AND RESEARCH LIBRARY AGENCY, INC. (METRO) PROVIDES AN OUTLINE FOR AN INITIAL INFORMATION TRANSFER NETWORK WITHIN A FIFTY MILE RADIUS OF TIMES SQUARE. THE TECHNIQUE OFFERED IS THE MORCHAND INFORMATION TRANSMISSION-RECEPTION SYSTEM (VIDEO). IN GENERAL TERMS, NOT BASED ON ANY ACTUAL FIELD INFORMATION, THE STUDY CONTAINS SCHEMATA OF THE METRO ASSOCIATES THAT THEORETICALLY CATEGORIZE THE AFFILIATES AS MEMBERS OF ONE OR MORE OF THREE GROUPS--THOSE THAT TRANSMIT, RECEIVE, OR BOTH TRANSMIT AND RECEIVE. IN ADDITION, THE INFORMATION HANDLED IS BROKEN INTO TWO BROAD AREAS--BIBLIOGRAPHIC AND TEXTUAL DATA. FINALLY, THE PRIMARY TECHNICAL CONSTRAINT ON EACH AFFILIATE IS IDENTIFIED AS THE TYPE OF TERMINAL EQUIPMENT INSTALLED IN THE MEMBER AFFILIATE'S COMMUNICATIONS CENTER. PROCEDURES, USING THE MORCHAND SYSTEM, ARE THEN BRIEFLY OUTLINED FOR THE REFERRAL OF REQUESTS, DETERMINATION OF THEIR URGENCY, RETRIEVAL FROM STORAGE, PREPARATION FOR TRANSMISSION, AND INFORMATION TRANSMISSION AND RECEPTION. IT IS ALSO SUGGESTED THAT METRO LIBRARIES SOON MOVE TO AN AUTOMATED STORAGE AND RETRIEVAL SYSTEM. CONCLUSIONS ARE THAT TELEVISION IS UNIQUELY CAPABLE OF BEING BOTH THE FASTEST MODE OF TRANSMISSION AND, THROUGH THE MORCHAND SYSTEM, THE COMMUNICATIONS FACILITY MOST CAPABLE OF HANDLING MASS TRAFFIC LOADS. A LIST OF THE METRO AFFILIATES IS APPENDED. (JB)

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for an

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CHARLES A. MORCHAND

METRO Miscellaneous Publication No. 2

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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# PRELIMINARY STUDY FOR AN IMPROVED INFORMATION TRANSFER SYSTEM FOR METRO LIBRARIES

by Charles A. Morchand

1. Who are the METRO affiliates?

The New York Metropolitan Reference and Research Library Agency, Inc. (METRO) comprises approximately fifty non-profit libraries and educational institutions in New York City's five boroughs, the adjoining county of Westchester and in nearby counties of New Jersey and Connecticut. ("Business corporations and other profit organizations with research libraries or with interest in the improvement of reference and research libraries may [become METRO affiliates] but without voting privileges.") The METRO affiliates include thirty-four college and university libraries. Public libraries and public library systems (covering all six New York counties) account for six of the METRO members and another six represent professional society libraries. The remaining four voting affiliates of METRO are also special libraries.

2. What is the nature and scope of their library collections?

Individual METRO libraries contain an example of every conceivable form of recorded information. These tangible representations of a society's ideas and expressions, ranging from the familiar hard-bound book to such ephemera as unedited sound recordings and mimeographed programs for international meetings, are used at every intellectual level. Their principal use, however, is by college level and advanced researchers. In addition, these library materials are in all languages and fall in all subject disciplines; they are from all geographic areas of the world and originate in all chronological periods of recorded history. The collections of the affiliated institutions include a total of approximately twenty-five million cataloged volumes.

3. How are these library materials bibliographically organized and physically stored?

Again, an extremely wide gamut is reflected by the METRO libraries. Physical housing of items is accomplished by a variety of means; library files range from small 3-by-5 card catalogs to reels of magnetic tape. A number of cataloging and classification schemes are employed for purposes of bibliographic organization.

4. What is the range of reference, referral, and information services provided by the METRO affiliates?

An adequate answer to this question would require far more data than presently exists concerning library collections and library services among the METRO affiliates. There are no inclusive guides which explicity describe the services presently provided at each library location or through interlibrary cooperation. Needed are profiles of collections and eligibility requirements of users, a comprehensive census of the library files which control these collections, and an exhaustive outline of the reference, information, and referral services provided by the libraries and information centers currently maintained

by the METRO affiliates. Once this has been done, several further questions could be asked and at least tentatively answered. For example, what communications facilities are now used for both intra-library and interlibrary information transfer among the approximately fifty METRO affiliates? What are the major problems impeding library services within each library and information center and across organizational boundaries both within larger parent institution and among the separate METRO affiliates?

This report represents both a modest beginning and an attempt to obviate the need for resolving many of these problems - not by avoiding them but by offering a technique - the Morchand Transmission (Video) System - which offers a telescoped advance in library communications.

## Design Objective

This preliminary study of a communications system among the approximately fifty affiliates of METRO (New York Metropolitan Reference and Research Agency, Inc.) has been prepared with the aim of providing an outline for an initial information transfer network within a fifty-mile radius of Times Square. The study contains schemata of the METRO associates in outlines which theoretically categorize the affiliates as members of one or more of three groups: those which only transmit; those which only receive; and those which both transmit and receive. In addition, the information being transmitted and received is broken into two broad areas: namely, bibliographic data and textual data. Finally, the primary technical constraint on each affiliate is identified as the type of terminal equipment actually installed in the member affiliate's communications center.

At present, the transfer of bibliographic data, and the texts this data identifies, is accomplished by a variety of hand and mechanical techniques in certain of the METRO agencies. Requests are transmitted by mail, messenger, telephone, and less occasionally, by teletype. Several METRO libraries, however, are participating in the current New York State experiment in telefacsimile transmission, a pilot program which allows one page every five minutes to be sent over narrow band, Stewart Warner Data Fax machines, and several types of Alden equipment. The picture quality of the transmitted "hard copy" is limited. It does allow the transmission of black and white half tones but these are of limited clarity and the machines usually do not transmit intelligible graphics smaller than six point type. Thus, mechanical telefacsimile transmission, although relatively inexpensive, is both slow for large traffic loads and unsatisfactory with regard to library standards for small type and pictures; this process does have, however, several immediate advantages in a total library communications network for small traffic loads answering urgent requests for textual material. No METRO libraries yet employ Long Distance Xerography or wirephoto in their communication with other libraries. The LDX is extremely expensive in both terminal gear and communications lines. ("The basic rental of an LDX Scanner is $550/mo.; for an LDX Printer, $650/mo." Xerox Data Sheet: July, 1967.) It does not transmit half tones nor does it print in color. Wirephoto systems, such as the system engineered by Westrex for The New Yorker Magazine, are even more expensive in both individually designed terminal equipment and in the high costs of wide band communications facilities. Neither LDX nor wirephoto (in their prototype forms) are economical for libraries and information centers. Both seem designed for commercial

printing applications, such as those of The New Yorker Magazine and McGraw-Hill Publishing Company; once initial use of these devices recaptures their design costs and equipment is manufactured on a large scale, thus again reducing costs, certain library applications might effectively exploit their characteristics. The major disadvantage to all three of these transmission modes is that none is designed for output from automated microphotographic storage devices.

Also, each of these systems requires that material be in a single-sheet format. Thus, material in bound volumes, for example, would have to be first reproduced into sets of single sheets, removing the copied page still another stage from the clarity of the original document.

## The Morchand Information Transmission - Reception System (Video)

No METRO library has yet employed video transmission for any of its interlibrary communication. Several engineering innovations, including U.S. and foreign patented inventions, and several new design configurations offer remarkable possibilities using video information transfer systems for libraries and information centers. These developments, known collectively as the Morchand System, utilize in a new mode both new inventions and several existing techniques for the transmission and display of all forms of library materials.

Briefly, the Morchand System is designed for retrieval of texts from microphotographic or digital storage and for transmission of retrieved texts to a requesting agency for display of soft copy or the making of hard copy from a TV display terminal.

In the System, pages of text or graphic matter can be accessed from storage and can be transmitted over any TV channel (via broadcast, co-axial cable, microwave relay, or satellite) - at a rate of several pages per second. Any page chosen can be displayed at the requester's TV screen up to fifteen minutes or less if desired. The number of pages transmitted per second can be increased four times by one of the Morchand techniques.

The System combines the advantages of television transmission, a quantity of pages per second, economically priced terminals, local and network and international transmission capability - (transmits to any locality within range of TV transmission) - and the ability to send graphics in half tones and in color. In addition, hard copy facsimile can be made as well as soft copy CRT displays and the system would be compatible with the fastest (or slowest) automated information retrieval devices whether using microphotographic or digital storage.

The System has been successfully engineered, and within a reasonable period of time, it should be available for demonstration. At the time of demonstration, full budgetary estimates together with delivery schedules will also be available. The technical specifications and projected practical applications of the System have been reviewed by qualified engineers and library personnel; both are eager to experiment with the use of such equipment.

## The Need for a Systems Design

As William J. Kessler noted at the EDUCOM conference on information networks, "it should be borne constantly in mind that no configuration of transmission paths or determination of technical capacity can be proposed seriously until it is known where the initial network nodes will be and what the initial mission of the networks will be." (A: p.287) Nodes, in the context of this report, a study which concentrates on video transmission, refer to each of the METRO affiliates in their role of participating members in a METRO communications system. Although there has not been the library systems engineering called for in Bibliography in an Age of Science, it is still necessary to identify the number of nodes and their equipment characteristics, the transmission capabilities of individual nodes and of those agencies serving both as individual nodes and as referral and directory information centers (unless METRO wishes to establish switching centers independent of any member agency), the storage capacities of all individual and central stores, and the role of the METRO network in state, regional and national library networks. This report does this only in a very generalized sense and is not based on any actual field information.

This report contains a description of a METRO library network - one which could easily be a prototype regional library network. It accepts the COSATI recommendation that "there is a requirement to have decentralized local access points to documents and information in order to meet the needs of a geographically dispersed user population," (B: p.4-11) and assumes without further description the participation by METRO in other information networks - state, regional and national. The report does not specify the contents of the member (or central) stores.

## A Prototype METRO System

All the approximately fifty METRO agencies will be designated individual nodes. As one of the EDUCOM conferees wryly noted: "Many of the member institutions will have difficulty maintaining enthusiasm for EDUCOM if they have no access to the network." (A: p.247) In addition to their roles as individual "send and receive" nodes, certain libraries should be designated subject and area referral centers. Examples of likely area referral centers for the METRO network would be: Brooklyn Public Library, The New York Public Library, Westchester Library System, and Queens Borough Public Library. The following METRO affiliates might serve as subject referral centers: The Metropolitan Museum of Art Library, The Engineering Societies Library, The New York Academy of Medicine, Columbia University Libraries, The New York Public Library and New York University. These libraries now serve as 3R's subject referral centers. (Two non-METRO affiliates in the New York Metropolitan area which now serve as New York State 3R's subject referral centers are Union Theological Seminary and Teachers College.) One METRO affiliate (or an independently located interlibrary loan center) would have to be designated as the location for the central referral agency. The New York Public Library seems the likeliest candidate for this assignment; it is already housing the new interlibrary office which is to be jointly directed by NYPL and METRO.

## Communications Facilities

Node designations for the approximately fifty METRO nodes are based on their technical communication capabilities. Minimum communications abilities and media in each agency's communications center would be: mail, messenger, telephone, and teletype. This would qualify the node as a small requester. The large requester would add a "receive" telefacsimile device and a cathode ray tube (television). The small sender would have mail, messenger, telephone, teletype, and telefacsimile "send" equipment. The large sender would add television transmittal capabilities to its repertoire of communications equipment. (Core-to-core computer transmission of bibliographic and textual data is also a possibility.)

The METRO central referral center would have the full range of communications facilities, from messenger to "send and receive" video equipment. The subject and area referral centers would be required to satisfy the "large senders" requirements. Costs for the creation and maintenance of the METRO network would be prorated on the basis of each METRO affiliate's contribution to the system, both in items loaned or transmitted and in equipment investment, and according to the use made of the system by each of the participating agencies.

## Referral of Requests and Determination of Urgency

There has been little report of operating experience for geographically discontiguous library systems; nonetheless, experiments in interlibrary cooperation presently being conducted by New York State offer some guide lines. For example, the 3R's program requires that each library system first search its resources before querying the central referral agency. The central referral agency, in turn, transmits the request to an area or subject referral agency. If the requesting agency cannot bibliographically identify the needed item, this fact is indicated, and the central agency, as part of its services, attempts to furnish this verification.

During the beginning phases of the METRO Library Network, the question of the relative urgency of a request could be quite simply treated. A request might be labeled as urgent or not urgent by the requesting agency. The METRO referral agency filling the request and preparing the requested item for transmittal would employ the following routine. If a request were labeled urgent, the referral (sending) agency would assign the item to its fastest transmittal facility, using as a queuing basis "first come, first served" and promising delivery within 24 hours of receipt of the request. If the request were labeled not urgent, the referral agency would assign the item to its most economical transmittal device, providing however, for a maximum of one week delivery time. Initially, the most economical means for the sending agency might be to mail or hand deliver a microfilm copy or the actual item itself to the requesting agency. With the installation of a television transmission system with multiplexing capabilities, however, the most economical, as well as the fastest, communications technique would be television. Thus, when retrieval and transmission aspects of the system are totally automated, delivery time for both urgent and non-urgent requests will be greatly reduced. It should be remembered, however, that even an automated communications will employ a variety of manual, mechanical, and electronic devices. Teletypes and telephones, for example, might continue to be used for the transfer of bibliographic information with television used for the transfer of the items or documents themselves.

## How an Actual Request is Filled

The process of accessing material to provide the requested information will eventually become automated; initially, however, it will be accomplished by nonautomated techniques. Requests will come in at first via teletype or telephone. The following information is asked from the requester:

(a) Name the desired item and identify it by bibliographic citation.
(b) Label the request urgent or not urgent.
(c) Identify the referral agency (or central referral store).
(d) Describe output requirements (color, hard copy, machine-readable form, etc.).
(e) Establish primary and secondary transmittal modes (e.g. mail, television).

## Operator's Response to Not-Urgent Requests

The operator will inform the requester of the approximate time (maximum of one week) his agency is likely to receive the requested material.

## Operator's Response to Urgent Requests

The operator will inform the requester of the approximate time it will take to access the document which will be transmitted via telefacsimile or television. After accessing the material from storage on a more rapid priority basis and bringing it to the telefacsimile device, a telephone call to the requester's telefacsimile device will announce it is about to be transmitted. Note that hand accessed requests at present take 15 to 20 minutes on the average to retrieve from the book stacks once the item has been identified in the transmitting agency's files.

## Retrieval from Storage

Initially the operator will hand the request to a library staff member who will verify the bibliographic citation and arrange for the retrieval of the material by hand. Whenever possible, a master microform of the material should be made and filed for future use. (See Preparing for Automated Access-Storage-Retrieval.)

## Preparation for Transmission

(1) Retrieved requests are prepared for transmission to the requester via (video) Morchand Information Transmission-Reception System. (This system is used for mass traffic load, color, half tones and all multi-paged texts.)

(a) Requests are batched according to each agency. They are then placed in the queuing order according to when each request was made. (A request must be made at least thirty minutes before one of the agency's transmission times.)
(b) Video tapes are made of all the requested pages, thus preparing them for transmission; this process utilizes vidicon cameras and other equipment in the Morchand System.

Each agency will receive its "Morchand system video transmitted text" batched, any number of pages, during predetermined times of the day so that an operator at the requesting agency can man the receiver for hard copy, etc. during that time. The amount of time allotted an agency will be based on its "Large" or "Small" requester category.

(2) Retrieved requests are prepared for transmittal by telephone, telefacsimile, television and other devices by bringing the retrieved text to these transmitter systems. Urgent material, as soon as it is retrieved initially will be sent by telefacsimile. This will relieve the strain on the mass traffic load that the TV is carrying and handle unexpected request surges.

(3) Retrieved requests so designated will be sent by mail or messenger.

Preparing for Automated Access-Storage-Retrieval

Naturally, the more parts of the total system that are automated, the more rapid and efficient the eventual system. Hand accessing requests from storage is a slow link in the system.

In order to progress as quickly as possible to automated access-storage-retrieval, a discipline should be established as the basis for an automated storage-retrieval system. As requests are received, a master microform of the retrieved text should be made; this should be done using a technique that can easily further be updated into more advanced microphotographic storage techniques, e.g. holography. (If, however, the requested item is not part of a collection deemed archivally valuable or an item in such constant demand for interlibrary loan that a more durable medium is required for physically storing and maintaining the item's usability, there may be no need for this costly production of master microform of archival quality.)

This material should be indexed and put in a storage file. Perhaps a simpler form of storage and retrieval file could be used right now (such as the Itek Memory Centered Precessor) with the purpose of starting simplified automation. The first stages of computerized indexing could be established at the same time.

It is proposed in this report that the METRO libraries move to automated storage and retrieval as soon as possible, using such storage devices as holographic when they become available. Then access to textual and graphic material can be accomplished very rapidly, eliminating the costly delay of hand accessing the actual items. The requester will be able to use telephone or dataphone devices, communicating from a distance and transmitting the appropriate code letters and numbers to the storage device, which will retrieve and transmit his text to him in a matter of seconds.

As noted in both the COSATI and the EDUNET reports, hardware to accomplish these improvements presently exists. For example, the dataphone could encode the requester's agency's name and his desire for hard copy or soft CRT display, etc. Automated retrieval can start as soon as there is a reasonable quantity of material in microphotographic storage. When automated retrieval is functioning, the system will respond to each requester as his request comes in, thus moving into an on-line, real-time mode.

## Actual Information Transmission

Telephone, teletype, telefacsimile, and other modes of transmission have been discussed in sections two and three of Preparation for Transmission. What follows is a description of the Morchand Transmission (Video) System.

## Information Transmission Using (Video) Morchand System

Having already discussed the proposed use of the Morchand System (Video) for document transmission in the section concerned with preparation for transmission, which describes the use of video tape, for example, as a transmitting medium, the report now outlines how this System can transmit retrieved requests to the METRO libraries. "The Morchand System processed video information" is next transmitted from the location at a "Large Transmitting Agency" via microwave relay or co-axial cable, to the location of a TV broadcast transmitter. Almost any of the New York City VHF or UHF channels could fill this requirement. Channel 31 has already indicated interest in cooperating with the proposed system. (See letter in Appendix.) All these channels transmit from the Empire State Building at present. There is only one microwave relay hop, line of sight from the NYPL to the north side of the Empire State Tower. (Estimated cost of microwave relay from NYPL to Empire State Building - $9,000 - $11,000.) If the transmitters move to the World Trade Center, it will be two hops. All the potential "Large Transmitter Agencies" in METRO can be connected to the Empire State or World Trade Center (move in 1971) transmitters by microwave relays or co-axial cable (many of which already have been laid; and connections can be made into going systems.) e.g. Manhattan Cable, Archdiocese of Brooklyn; 25 mgc. transmitter, St. Joseph's Seminary, Yonkers.

The fifty-mile transmission radius of these TV channels (See Appendix, estimated field pattern of WNYC-TV, Channel 31) will comfortably reach any of the libraries and information centers maintained by the approximately fifty METRO affiliates. (See Appendix map of New York Metropolitan area.) This will reach any point within the radius thus opening up possibilities for new affiliates, and income from private parties, business, government, industry, etc., who might want to participate.

In the future METRO may decide to process requests from out of state or internationally. The proposed system will make METRO a ready information link in a nationwide or international library network.

## Information Reception

(1) Telefacsimile, etc.
Hard copies are made at the requesting agency by the appropriate terminal equipment.

(2) a. Morchand Information Reception System
The TV receivers for the System can be located anywhere within the fifty-mile radius of TV transmission, thus at METRO libraries as well as other locations. (Non-members could be charged differently for the service.) The terminal would include: (1) a telephone to make the request call (this would be a Dataphone when the storage-retrieval system is automated) and (2) a Morchand System display terminal including a TV receiver, etc.

b. Morchand System Hard and Soft Copies

The terminal could display soft copy or hard copy could be made. At first an operator at each agency would run the terminal device and make the hard copies during the batching transmission time assigned to that agency. When the storage-retrieval process is automated, each requester at an agency will be able to receive hard or soft copy as he desires.

Hard copy of long articles can be made for re-reading on video discs or video tape. Hard copy on paper can be made from the CRT display by various equipment produced by RCA, 3M, Polaroid and other companies.

Summary

To conclude, television is uniquely capable of being both the fastest mode of transmission and, through the Morchand Systems, the communications facility most nearly capable of handling mass traffic loads. Further design of such peripheral equipment as efficient page turners and techniques for rapid feed of individual pages are necessary before the speeds afforded electronically by television can be matched to manual and mechanical storage and dissemination devices. Also required would be the installation of television receiving equipment in the communications centers of all METRO agencies, including those designated small requesters. This can be done for a system employing the Morchand Systems simply by adapting a standard CRT (commercially produced television set) and adding an inexpensive frame store device. This television equipment would be much cheaper than any other image or digital transmission and receiving equipment and would enable the METRO agencies to combine in a single system the techniques for receiving their most urgent requests (in color, half tones, etc.) and, on a delayed basis, all other interlibrary loan requests (the system's mass traffic load). Equipment such as telephones and teletypes, already installed in most METRO agencies for a variety of program and administrative activities, would still be employed for such uses as establishing the bibliographic identity of wanted items and ascertaining their location and availability. Finally, having the Morchand Systems and television equipment implementing this technique in all of the METRO agencies would emphasize that all libraries both lend and are the recipients of loans.

## METRO AFFILIATES

Barnard College

Briarcliff College

Brooklyn College

Brooklyn College of Pharmacy

Brooklyn Public Library

The Center for Inter-American Relations

Chemists' Club

City College

Columbia

Cooper Union

Cornell U. Medical College

Council on Research in Bibliography, Inc.

Engineering Societies Library

Finch College

Fordham University

Foreign Relations Library

Good Counsel Library

Graduate Studies Division, CUNY

Hunter College

Iona College

Jewish Theological Seminary

LIU, Brooklyn Center Library

Manhattan College

Manhattanville College of the Sacred Heart

Maryknoll Seminary Library

Marymount, Tarrytown

Marymount Manhattan

Mary Rogers

Medical Library Center of New York

Memorial Sloan-Kettering Cancer Center

Mercy College

Metropolitan Museum of Art

Montclair State College

College of New Rochelle

New York Academy of Medicine

The New York Public Library

New York Society Library

Polytechnic Institute of Brooklyn

Pratt Institute

Queensborough Public Library

Queens College

Rockefeller University

St. John's University

St. Peter's College

Sarah Lawrence

State University of New York, Maritime College

Westchester Library System

White Plains Public Library

Yeshiva University

Yonkers Public Library

New York University